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Construction Methods

1. The methods of highway construction were relatively primitive in Siberia, and mechanized equipment was not introduced on any significant scale until around 1935. After the initial surveying and planning stage, the roads were levelled and graded with mechanized equipment. Any necessary blasting was done with "armmol". The roads were constructed with .70 meter ditches on each side for the drainage of water. All roads in Siberia were made with a surface of gravel and all the bridges were made of wood. Bridges were constructed at right angles to a river, even if it meant a sharp change in direction of the road. There were certain set regulations governing road construction such as the regulations for steepness of grades which provided third class roads with not more than a 7% grade, second class not more than 5% grades, and first class roads with a maximum of a 3-5% grade. Any steeper incline would have to be skirted or zigzagged in order to remain in conformity with the specifications. The standard gravel depth of roads was 17 cm of gravel for third class roads, and 25 cm of gravel for first and second class roads. The road beds of second class roads were ten meters in width, with eight meters the width of the layer of gravels. For third class roads the widths were eight meters and six meters, respectively.

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SECRETMechanized Equipment

2. Mechanization in road construction was introduced about 1930 and was insignificant [redacted] until about 1935 or 1936. In 1930 [redacted] the Ministry of Road Construction [redacted] equipment then available. It consisted of two caterpillars and two mechanized graders. No trained personnel to operate them were available, so this equipment was virtually useless. During the following years more mechanized equipment became available, as well as trained operating personnel.

3. In 1935 [redacted] a road in Mongolia between Nizhny Ust'khun (50° 03' N - 112° 57' E), 326 kilometers to Uudurkhan which is on the Kherlen river near Mangut (49° 42' N - 112° 40' E). [redacted] had three graders each with a tractor of 60 horsepower. The graders used were all of the American type and came in three different widths, twelve feet, eight feet, and six feet. There were 15 Baker shovels with a capacity of .75 cubic meters. Five of these shovels are pulled in a column by one 60 horsepower Ch.T.Z. tractor, and there were three tractors for these fifteen Baker shovels. There was also one leveller (utyugi) of about 1/2 ton drawn by a 20 horsepower Ford tractor. Three Zis three-ton trucks were also attached to this part of the mechanized column, two of which were used for carrying gasoline. There was one 12-ton Soviet-type digger (ruter), as well as one or two other Soviet-type 2-ton diggers called rykhiteli. There was also one large Soviet-type plow (kanavokapatali) weighing four tons and drawn by a Ch. O.Z. tractor. In the rolling column were six rollers [redacted]. They used oil rather than steam as fuel, due to the steepness of the grades in this area. The transport column for this section of road construction consisted of ten columns of twenty-five Zis trucks or 250 Zis trucks altogether. There were no bulldozers [redacted] in this area. The bulldozers are what [redacted] lacked most. [redacted] needed larger sized graders, and bigger Baker shovels, as well as more oil-burning rollers. During this period of road construction [redacted] never had adequate mechanized equipment or sufficient trained personnel to operate them. [redacted] from 1941 to 1943, [redacted] supplies of mechanized equipment were even more limited than they were in Mongolia, and this situation is probably prevalent throughout the USSR.

Road Building Materials

4. The procurement of road building materials was divided into two groups, those procured from central authority and those procured from the local economy. The supplies procured from the central authorities were usually inadequate in amount and long delayed in arrival. Materials such as iron, cement, gasoline, oil, road building tools and mechanized equipment had to be procured from the central authorities. All of them arrived in inadequate amounts, especially iron, gasoline, and cement. For lack of bolts and other iron fittings to hold logs together, it was sometimes necessary to construct bridges without them and then insert them when the supplies finally arrived. [redacted]

Procurement involved long delays in orders being filled through central authorities in Moscow. The military projects always got first preference

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and the left over materials were allocated to the routine road construction projects. The instruments for surveying and other tools were often of poor quality and of odd sizes, some of which could not even be assembled. Measuring instruments were especially scarce. Tires for the motor vehicles were of synthetic rubber and of such poor quality that they were sometimes worn out after a week.

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5. There were seldom any problems in the procurement of sufficient quantities of the supplies obtainable from the local economy, such as wood, stone and gravel. During the planning stage of road construction, provision is made for the procurement of these locally available materials, and the only problems we ever faced in this respect was the matter of transportation. Transportation was not handled by the central authorities, but had to be arranged by the local construction crews. It was quite usual to have to go thirty kilometers for supplies of wood or gravel.

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Technical Problems

6. One of the problems which recurred frequently was that the road construction personnel did not have adequate instructions as to standard operating procedures. The result was that the supervisor was plagued constantly by questions of a routine nature and work was delayed unnecessarily. Even as routine a question of whether a stump had to be removed if it projected more than six centimeters above the bed of the road, would be referred to the supervisor for his decision. [] the standard procedures have been formalized by now, and distributed to the personnel concerned. Another major problem was the lack of trained technical personnel and the rapid turnover of those assigned to a construction project. A technical person rarely stayed in one place for more than a year before he would manage to get transferred. In the early thirties, the technical personnel would sometimes leave on a vacation and not return, as in those days, labor assignments were not strictly controlled and governmental authorization for every change of location was not required. During the early years of mechanization, from 1933 to 1935, technical personnel were sent along to help operate the new equipment, but there was a turnover of as much as 50% of them each year. This resulted in a considerable waste of time in the training of new personnel to operate the equipment.

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Climatic Problems

7. Climatic conditions in Eastern Siberia posed special problems which necessitated the development of makeshift solutions. Regular road construction could be carried out only from late May or early June to October. The extreme frost and snow during the six months from November through April prevented any progress from being made except in the building of bridges and of wooden buildings for the workers and maintenance crews.
8. One special problem caused by the harsh Siberian winter was the tendency of the ice on the rivers to mount up over the bridges and make it impossible to travel along the roads in winter. [] ice [] had mounted up five meters above a bridge on a road near Lake Baykal. This problem was fairly easily solved by noting the locations where this freezing over was likely to occur, and then putting in several 1.5 or 2 meter length wooden posts in the river bed somewhat upstream of the bridge, so that the ice would build up around the posts.

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9. Thawing presented no great problem for road construction in Eastern Siberia as the ground below .75 m. remained frozen all year around. Some difficulties arose in connection with the construction of bridges and buildings. The foundations were embedded in the earth about one meter in depth and tended to melt the frozen ground directly beneath them; in this fashion, they sometimes sank below the level intended. Efforts were made to line the bottoms of the foundations with rocks and ballast to prevent this sinking, but these efforts were never wholly successful. Sometimes bridges would get pushed up by the frost and subsequent thaw, and the road would have to be built up over them to compensate for the rise. Snow plows, snow fences and snow barriers were used to clear the roads of snow.

Road Maintenance

10. There are three different types of road repairs: minor, medium, and capital. Minor repairs were conducted all the time by the regular maintenance crew to smooth over humps and minor deteriorations in the road. Medium repairs were conducted about every five years in Siberia to fill up larger holes in the road with fresh gravel. Medium repairs could usually be carried out by the regular road maintenance crew, sometimes with the help of the local highway administration. Capital repairs took place about every twenty years, depending on how rapidly the road deteriorated, and involved the complete removal of the old gravel and its replacement by a new layer of gravel. For this type of repair the regular maintenance crew had to receive help from the local highway administration including the sending of special machinery.
11. Permanent maintenance crews were assigned to each road. There was a road master responsible for maintenance of a section (twenty-five kilometers, or fifty kilometers for minor roads). Each road master had a brigade of eight to ten workers under his authority. Each of these workers was assigned to a section of the road from two to five kilometers in length to keep in good repair. These workers lived in small government-built wooden houses with their families, right on the section of the road to which they were assigned. They received extremely low wages in addition to the government donated house and land upon which it was built.

Surface Deterioration

12. The roads in Mongolia lasted a long time because the ground was very firm. The traffic was never very heavy on these roads, and major deterioration, if any, was caused by tanks only. This was true in spite of the simple construction methods used in Mongolia. Capital repairs would be necessary in those rare cases where the road had one of clay, as the clay would expand with the spring thaw and ruin the road completely.

Bridges

13. The three principal types of bridges used [redacted] were the Balichai, the Rigel', and Fermi Gau type of bridge. All three of them had a maximum load of sixty tons, and all were made of wood with metal used for bolts and other fastening devices. The Fermi Gau type also features some steel supports in addition to the wood, and it is the one used for the wider rivers. The most commonly used type bridge was the Balichai. The Balichai and Rigel' type bridges have either two or four lanes; the Fermi Gau always has two lanes, one for each direction.

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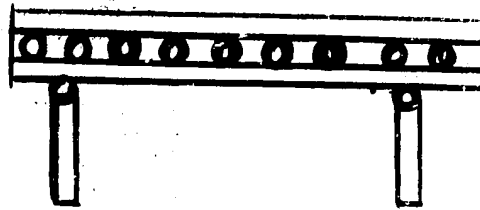
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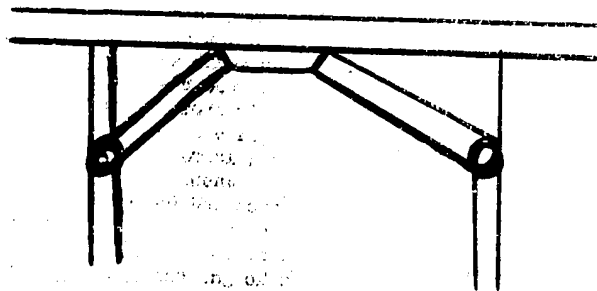
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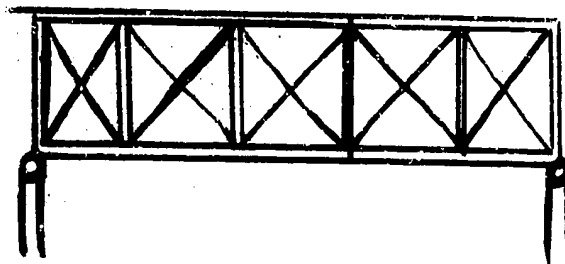
Balichnii



Rigel'



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